

**DEPARTMENT OF ENVIRONMENTAL QUALITY  
PERMITTING and COMPLIANCE DIVISION  
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM  
(MPDES)**

**Fact Sheet (FS)**

Permittee:	City of Red Lodge
Permit No.:	MT0020478
Receiving Water:	Rock Creek
Facility Information:	
Name	City of Red Lodge Wastewater Plant
Location	Two Mile Bridge Road
Facility Contact:	Skip Boyer, Director of Public Works 1 South Platt P.O. Box 9 Red Lodge, MT 59068  406-446-1681
Fee Information:	
Number of Outfalls	1
Outfall – Type	001-Major POTW

## I. Permit Status

The previous MPDES permit was issued on February 1, 2000 and expired on December 31, 2004. Based on upgrades to the lagoon and collection system, the permit was modified in October 2001 to: 1) change the location of the outfall, 2) reduce fecal coliform limits, 3) include requirements for land application of biosolids and sludge, and 4) modify the mixing zone. An incomplete Department of Environmental Quality (DEQ) Form 1 and Environmental Protection Agency (EPA) Form 2A were received on July 27, 2004 to renew the permit. The Department returned the application and requested additional information and correct signatures. On September 27, 2004 the Department considered the application complete and administratively extended the permit.

## II. Facility Information

### A. Facility Description

The City of Red Lodge Wastewater Plant (Red Lodge WWP) is an aerated lagoon system located on Two Mile Bridge Road about one mile north of Red Lodge. The lagoon and collection systems were upgraded in 2001. Influent flow is monitored at a Parshall flume (Figure 1). Raw wastewater enters the headworks building where it passes through a mechanical screen or an overflow/bypass manual screen that removes large objects. A grit removal system removes fine, inorganic particles from the wastewater stream. Solid waste from the headworks is disposed of at the local landfill. Pretreated wastewater flows to the three four-acre lined and aerated lagoon cells. Aeration is achieved through submerged static tubes in the lagoon cells and air blowers located in the headworks building. Two control structures and several valves allow for flexibility in routing wastewater through the three cells to achieve the desired degree of aeration and/or retention time. Lagoon cells can be operated in series or the first two cells can be operated in parallel when the first cell is overloaded. An adjustable weir gate controls the water level of the first cell and a constant level weir establishes the water surface in the second and third cells. Effluent can be drawn out of the third cell from three different levels so the operator can chose the level that provides the cleanest discharge to Rock Creek.

Effluent from the lagoon is disinfected using ultraviolet (UV) light before passing through a Parshall flume. Effluent flow is monitored at the Parshall flume after UV disinfection (see Figure 1). Two outflow pipelines are located on either end of the UV disinfection system which will supply a future pump station for land application (spray irrigation) of a portion of the effluent.

The September 2004 application states the design flow of the upgraded lagoon system is 1.2 million gallons per day (mgd) compared to the design flow (0.285 mgd) of the previous lagoon system. Treated effluent is continuously discharged through an 18-inch buried outfall pipe to Rock Creek that discharges at the Two Mile Bridge about one-half mile northwest of the Red Lodge WWP. Table 1 summarizes the current design criteria for the upgraded facility.

The permit application states that groundwater drains are being removed from the sanitary system and storm drain inlets are being repaired to reduce inflow and infiltration.

**Table 1. Current Design Criteria Summary – City of Red Lodge**

Facility Description:	
Three-cell lagoon with enhanced aeration and UV disinfection.	
Construction Date: 1960	Modification Date: 1986, 2001
Design Year: 2017	(left blank)
Design Population: 3,605	Population Served: 2,300
Design Flow Average (mgd): 1.2 mgd	Design Flow, Peak (mgd): 3.0 mgd
Primary Cells: one	Secondary Cells: two
Minimum Detention Time (System) (days): 26.4	
Design BOD <sub>5</sub> Removal (%): unknown	Design Load (lb/day): 613
Design SS Removal (%): unknown	Design Load (lb/day): 721
Collection System: separate	
SSO Events (Y/N): N	Number:
Bypass Events (Y/N): Y	Number: one
Inflow Flow (mgd): 0.43	Source: ground water and storm water drains
Disinfection: Yes	Type: UV
Discharge Method: continuous	
Effluent Flow Primary Device: Parshall flume	
Recording Device: totalizer	
Sludge Storage: none	
Sludge Disposal: one-half mile northeast of lagoon at future spray irrigation site	EPA Biosolids Permit Authorization: MTG650022

#### B. Effluent Characteristics

Table 2 summarizes monthly self-monitoring effluent data reported by the Red Lodge WWP during the period of record (POR) January 2002 through September 2007.

**Table 2: Effluent Characteristics<sup>(1)</sup> for the Period January 2002 through September 2007.**

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number of Samples
Flow, Daily Average	Effluent	mgd	(6)	0.288	1.597	0.656	69
Biochemical Oxygen Demand (BOD <sub>5</sub> )	Influent	mg/L	(6)	4.3	230	81.1	69
	Effluent	mg/L	45/30 <sup>(5)</sup>	1.3	27	11.6	69
	Effluent	% removal	65	--	--	--	--
	Effluent	lb/day	153 <sup>(8)</sup>	--	--	--	---
Total Suspended Solids (TSS)	Influent	mg/L	(6)	1.6	243	94	69
	Effluent	mg/L	135/100 <sup>(5)</sup>	10	56	14.9	69
	Effluent	% removal	(7)	--	--	--	--
	Effluent	lb/day	511 <sup>(8)</sup>	--	--	--	--
Fecal Coliform Bacteria (2), (3)	Effluent	#org/100mL	400/200 <sup>(5)</sup>	1	350	13.9	35
pH	Effluent	s.u.	6.0-9.0	6.05	9.4	--	69
Temperature	Effluent	°F	(7)	32	72	48.7	69
Total Residual Chlorine	Effluent	mg/L	(7)	--	--	--	--
Total Ammonia as N, winter <sup>(4)</sup>	Effluent	mg/L	(6)	2.3	11.1	8.2	12
Total Ammonia as N, summer <sup>(4)</sup>	Effluent	mg/L	(6)	0.6	10.3	6.4	13
Total Kjeldahl Nitrogen	Effluent	mg/L	(6)	5.5	15.8	10.5	26
Nitrate + Nitrite as N	Effluent	mg/L	(6)	0.08	1.85	0.46	26
Total Nitrogen	Effluent	mg/L	(6)	6	14	11	26
		lb/day	73 <sup>(8)</sup>	3.6	200.7	61.3	42
Total Phosphorus as P	Effluent	mg/L	(6)	1	2.2	1.7	26
		lb/day	18 <sup>(8)</sup>	0.5	28.9	9.7	42
Dissolved Oxygen	Effluent	mg/L	(7)	--	--	--	--
Oil and Grease	Effluent	mg/L	(7)	--	--	--	--
Total Dissolved Solids	Effluent	mg/L	(7)	--	--	--	--

## Footnotes:

- (1) Conventional and nonconventional pollutants only; table does not include toxics.  
 (2) Sample period is April 1 through October 31.  
 (3) Geometric mean  
 (4) Winter period is November 1 through March 31; summer period is April 1 through October 31.  
 (5) Weekly average/Monthly average  
 (6) No limit in previous permit; monitoring requirement only.  
 (7) No monitoring or effluent limit in previous permit.  
 (8) Nondegradation Annual Average Load Value, not a permit limit. Nutrient loads calculated using Appendix III data set.

As part of the application process, the facility submitted analytical results from one effluent sample collected on June 29, 2004 for total recoverable metals, volatile and semi-volatile compounds. Copper, magnesium and zinc were detected at 0.01 mg/L, 6 mg/L and 0.02 mg/L, respectively. No volatile or semi-volatile compounds were detected. This is insufficient data to determine if water quality standards in Rock Creek are exceeded for these parameters. Increased monitoring requirements in this permit will collect the necessary data to evaluate these potential pollutants during the next permit cycle.

Dischargers greater than 1.0 mgd must provide WET testing results to the Department [ARM 17.30.1322(6)(i)(i)]. The facility passed a WET test for two species on June 29, 2004.

### C. Compliance History

The permittee received a violation letter dated October 29, 2001 for exceeding the BOD<sub>5</sub> effluent limit in July and August 2001. The permittee also received a violation letter dated December 3, 2001 for bypassing the lagoon during construction activities of the upgraded lagoon cells. The bypass was discontinued when the construction project was completed in 2001.

During 1997 and 1998, discussions between the City of Red Lodge and the Department were held concerning whether a moratorium should be imposed on connections of existing approved lots to the Red Lodge WWP because the city was close to violating Montana's Nondegradation Standards [see letter from the Department to Honorable Phillip A. Miller, Mayor (April 3, 1998 archive file)]. The Department's letter stated "The Department cannot approve any new lots or other connections to the existing wastewater system because further significant degradation of Rock Creek would occur unless an equivalent number of similar approved lots or service connections are prohibited from connection to the system".

### D. Inspection Results

Based on an October 18, 2001 compliance inspection report, the age of the collection system is greater than 50 years old. One pump station is maintained. Collection system upgrades that were made in 2001 are described in *Red Lodge Sewer Improvement Operation and Maintenance Manual* (June 1985) prepared by HKM Associates. Two projects are described in the document: 1) the construction of approximately 5,252 lineal feet of new sanitary sewer, two flow metering and sampling stations, 16 sanitary sewer manholes and a buried crossing at Rock Creek; and, 2) the construction of approximately 5,040 lineal feet of storm sewer, 18 manholes, the replacement of 210 lineal feet of sanitary sewer, adjustments of existing water mains and services and a crossing at U.S. Highway 212. These two projects were completed with the lagoon upgrade project in 2001 and reduced the inflow/infiltration (I/I) into the lagoon by approximately 0.288 mgd; however I/I contribution remains at the facility [DEQ State Revolving Fund Inspection Report. (May 26, 2004)]. The City of Red Lodge has also installed storm drain piping along the West Bench which has eliminated most of the spring water (ground water) that was entering the sanitary sewer (personal communication with Skip Boyer, City of Red

Lodge Public Works Director on August 29, 2008). During the lagoon upgrade, sludge from the three lagoon cells was land applied under the EPA Biosolids permit at the future spray irrigation site located one-half mile northeast of the lagoon.

The City of Red Lodge did not include land application disposal in the renewal application. The City has purchased land and installed outflow pipelines on either side of the UV disinfection system to allow future land application of a portion of the wastewater from the lagoon system (January 17, 2008 inspection report). This permit does not address the future land application system, nor does it authorize a discharge to the proposed land application site. If the future land application system is initiated during this 5-year permit cycle, the permittee must first submit an updated application that includes additional land application information and request a modification to this permit.

### III. Technology-based Effluent Limits (TBELs)

#### A. Authority and Scope

The Montana Board of Environmental Review has adopted by reference 40 CFR 133 which define minimum treatment requirements for secondary treatment, or the equivalent, for publicly owned treatment works (POTW) (ARM 17.30.1209). Secondary treatment is defined in terms of effluent quality as measured by Biochemical Oxygen Demand (BOD<sub>5</sub>), Total Suspended Solids (TSS), percent removal of BOD<sub>5</sub> and TSS, and pH.

These requirements may be modified on a case-by-case basis for facilities that are eligible for treatment equivalent to secondary (TES) treatment [40 CFR 133.101(g)] or alternative state requirements (ASR) for TSS. To determine if a facility is eligible for TES the facility must meet the requirements of 40 CFR 133.101(g), summarized as follows:

- 1) The BOD<sub>5</sub> and TSS effluent concentrations consistently achievable through proper operation and maintenance of the treatment works exceed the minimum effluent quality described for secondary treatment (40 CFR 133.102).
- 2) The treatment works utilize a trickling filter or waste stabilization pond and,
- 3) The treatment works utilizes biological treatment that consistently achieves a monthly average of at least 65 percent removal [40 CFR 133.101(k)].

Water quality must not be adversely affected by the application of equivalent to secondary treatment. Effluent limits for BOD<sub>5</sub> cannot be relaxed unless the permittee has demonstrated that the relaxed limits will not result in a violation of water quality standards in the receiving water.

In addition to TES, permitting agencies may give special consideration to treatment works that employ waste stabilization ponds as the primary method for treating wastes. ASR may be incorporated into permits for lagoons if historic data for the system indicates that effluent limits based on TES cannot be achieved. The monthly ASR for TSS in Montana is

100 mg/L [49 FR 37005; September 20, 1984]; the Department employed a 135 mg/L TSS for a weekly limit based on best professional judgment. New facilities are not eligible for ASR.

The proposed TBELs satisfying the requirements of ARM 17.30.1209 are given in Table 3. These limits are based on:

1. The effluent limits for BOD<sub>5</sub> in the previous permit are a weekly average of 45 mg/L and a monthly average of 30 mg/L. These limits will remain in the renewed permit because data demonstrates that the facility can consistently achieve these limits through proper operation and maintenance. (For the POR, the average BOD<sub>5</sub> concentration is 11.6 mg/L and the 95<sup>th</sup> percentile is 18 mg/L). The previous permit included a 65 percent removal limit for BOD<sub>5</sub>. The 65 percent removal limit for BOD<sub>5</sub> will remain in this renewal permit because after the facility eliminated most of the inflow and infiltration to the sanitary system, the influent is less concentrated wastewater (than other systems) and the total average flow to the POTW is less than 285 gallons per capita per day [40 CFR Part 133.103(d)].
2. The effluent limits for TSS in the previous permit are 135 mg/L for a weekly average and 100 mg/L for a monthly average. These ASR limits are reduced in this permit to a weekly average of 65 mg/L and a monthly average of 45 mg/L because data demonstrates that the facility can consistently achieve these limits through proper operation and maintenance (For the POR, the average TSS concentration is 15 mg/L and the 95<sup>th</sup> percentile is 31 mg/L). The previous permit did not include a percent removal limit for TSS. This renewal permit includes a 65 percent removal limit for TSS for the same reason described above for BOD<sub>5</sub>.

ARM 17.30.1345(8) requires that all effluent limits be expressed in terms of mass except for pollutants which cannot be appropriately expressed in terms of mass. For municipal treatment plants mass-based limits are based on design flow for the facility. The previous mass-based limits are based on a design flow of 0.285 mgd. As the result of a facility upgrade in 2001, the City of Red Lodge increased the Red Lodge WWP design flow to 1.2 mgd. The following equation is used to calculate BOD<sub>5</sub> and TSS mass-based load allocations using National Secondary Standard limits at the new design flow of 1.2 mgd:

$$\text{Load (lb/day)} = \text{Design Flow (mgd)} \times \text{Concentration (mg/L)} \times \text{Conversion Factor} \quad (8.34)$$

BOD<sub>5</sub>:

$$\begin{aligned} 30\text{-d Load} &= 1.2 \text{ mgd} \times 30 \text{ mg/L} \times 8.34 &= & 300 \text{ lb/day} \\ 7\text{-d Load} &= 1.2 \text{ mgd} \times 45 \text{ mg/L} \times 8.34 &= & 450 \text{ lb/day} \end{aligned}$$

TSS:

$$\begin{aligned} 30\text{-d Load} &= 1.2 \text{ mgd} \times 45 \text{ mg/L} \times 8.34 &= & 450 \text{ lb/day} \\ 7\text{-d Load} &= 1.2 \text{ mgd} \times 65 \text{ mg/L} \times 8.34 &= & 650 \text{ lb/day} \end{aligned}$$

**Table 3. Proposed TBELs for BOD<sub>5</sub> and TSS**

Parameter	Concentration (mg/L)		Load (lb/day)	
	Weekly Average <sup>1</sup>	Monthly Average <sup>1</sup>	Weekly Average <sup>1</sup>	Monthly Average <sup>1</sup>
BOD <sub>5</sub>	45	30	450	300
TSS	65	45	650	450
pH, s.u.	Within the range of 6.0 to 9.0 (instantaneous)			
BOD <sub>5</sub> Percent Removal <sup>1</sup>	65 %			
TSS Percent Removal <sup>1</sup>	65 %			
1. See Definition section at end of permit for explanation of terms				

Load limits for technology-based parameters of concern (BOD<sub>5</sub> and TSS) apply to the effluent and will be maintained at the more stringent of the nondegradation allocations or mass-based loading limits.

#### B. Nondegradation

The provisions of ARM 17.30.701, *et seq.* (Nondegradation of Water Quality) apply to new or increased sources of pollution [ARM 17.30.702(18)]. Sources that are in compliance with the conditions of their permit and do not exceed the limits established in the permit, or as determined from a permit previously issued by the Department, are not considered new or increased sources.

In the November 12, 1997 SOB, BOD<sub>5</sub> and TSS nondegradation load allocations were calculated as 71 lb/day and 238 lb/day, respectively (DEQ Red Lodge archive administrative file).

An increased BOD<sub>5</sub> load limit of 153 lb/day and TSS load limit of 511 lb/day were included in the May 2000 SOB. The increased BOD<sub>5</sub> and TSS loads were justified in the May 2000 SOB using a multiplier (0.613 mgd) based on the total volume and detention time of the lagoon system (also see the May 24, 2000 letter from the Water Protection Bureau to MSE-HKM Engineering). The May 2000 SOB and May 24, 2000 letter from the DEQ state “the new values increase the BOD<sub>5</sub> and TSS baseline load allocations. However, these values appear to more accurately describe the design capacity of the lagoon wastewater treatment system and will supersede the earlier values for purposes of determining significance as a new or increased source under Montana’s Nondegradation Rules”.

BOD<sub>5</sub>, TSS, nitrogen and phosphorus nondegradation load allocations in the modified October 2001 SOB are listed in Table 4. These load limits were not included in the modified October 2001 MPDES permit. The modified October 2001 SOB calculated mass-based nondegradation limits for BOD<sub>5</sub> and TSS using a design flow of 0.285 mgd.



Total nitrogen and total phosphorus nondegradation load allocations in Table 4 were calculated using the Department of Health and Environmental Sciences memorandum (DHES, October 1994). Calculations for total nitrogen and total phosphorus using the DHES 1994 method are not based on administrative rule or water quality standards. These estimates will not be used in this permit. Total nitrogen and total phosphorus load allocations will be calculated in this permit based on the existing level of performance of the wastewater treatment plant and discharge monitoring report (DMR) data (see Section IV.E.2 below).

**Table 4. Nondegradation Loads**

<b>Parameter</b>	<b>Allocated Average Load (lb/day)</b>
BOD <sub>5</sub>	153
TSS	511
Nitrogen	73
Phosphorus	18

The proposed monthly average mass-based TBEL load (300 lb/day) in Table 3 for BOD<sub>5</sub> exceeds the nondegradation load (153 lb/day) for BOD<sub>5</sub> in Table 4 (The weekly average BOD<sub>5</sub> load was not previously calculated. Based on 40 CFR 133.101(f)(2), this value was calculated to be 230 lb/day by multiplying the nondegradation BOD<sub>5</sub> load of 153 lb/day x 1.5 (see Table 5). The proposed monthly average mass-based TBEL for TSS (450 lb/day) does not exceed the nondegradation load (511 lb/day) in Table 4.

In order to maintain compliance with Montana's Nondegradation Rules in ARM Chapter 30, Subchapter 7, the Department is not allowing an increase in the pollutant load for BOD<sub>5</sub> and TSS beyond the amount authorized in Table 4. Pursuant to these nondegradation provisions, any increased source of pollutants is subject to significance review under the criteria in ARM 17.30.715. Therefore, BOD<sub>5</sub> load limits will be maintained at the nondegradation load (153 lb/day) so the facility is not considered a new or increased source as defined in ARM 17.30.702(18). TSS load limits will be maintained at the TBEL load limit in Table 3.

#### IV. Water Quality-based Effluent Limits

##### A. Scope and Authority

Permits are required to include water quality-based effluent limits (WQBEL) when technology based effluent limits are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards (ARM 17.30.601 *et seq.*) define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses. New sources, as defined in ARM 17.30.703(16), are subject to Montana Nondegradation Policy (75-5-303, MCA) and regulations (ARM 17.30.701, *et. seq.*).

## B. Receiving Water

Wastewater is discharged from the Red Lodge WWP to Rock Creek, which is a tributary to the Clark Fork Yellowstone River. The receiving water is classified as B-1 according to Montana Water Use Classifications [ARM 17.30.611(1)(b)(iii)]. Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. Degradation which will impact established beneficial uses will not be allowed. The B-1 classification for Rock Creek is consistent with the previous SOB.

Rock Creek is located within the Upper Yellowstone watershed as identified on United States Geological Service (USGS) Hydrological Unit Code (HUC) 10070006 and Montana Stream Segment MT43 D002\_131. Rock Creek in the vicinity of the discharge is listed on the 1996 303(d) list as impaired for cold water fishery. Probable causes of impairment are: flow alteration, nutrients and other habitat alterations. Probable sources of impairment are: agriculture, highway/road/bridge construction, irrigated crop production and municipal point sources. Rock Creek in the vicinity of the discharge is listed on the 2006 303(d) list as partially supporting aquatic life, cold water fishery and primary contact recreation. Probable causes of impairment are flow alterations. Probable sources of impairment are water diversions and irrigated crop production.

The USGS maintains a gauging station (USGS 06209500) on Rock Creek. This station is located on the left bank, 40 feet downstream from a county bridge, 6.7 miles south of Red Lodge at river mile 49.1 (about 8 miles upstream from the Red Lodge WWP). For the POR April 1932 to January 2000 (with some limited interruptions of data collection) the 7Q10 flow of Rock Creek is 21 cfs. This USGS station is located above the confluence of Rock Creek and West Fork Rock Creek and does not include the contributing flow from West Fork Rock Creek. The USGS did maintain another gauging station on West Fork Rock Creek from 1937 to 1956 and flow data was collected at this gauging station. The previous permit (Modified October, 2001), using STORET data and the FLOSTAT model, calculated a 7Q10 flow for Rock Creek (26.2 cfs or 17 mgd) by adding the flow from Rock Creek (21.4 cfs or 13.8 mgd) and West Fork Rock Creek (5 cfs or 3 mgd). Monthly 7Q10 flows for Rock Creek were also estimated in the Modified October 2001 SOB using the FLOSTAT model and STORET data.

The Department reviewed data used to calculate Rock Creek flows and determined it was too old to provide a representative flow measurement for the current flow in the stream. In addition, Jim Gruber, water commissioner for the Rock Creek Water Users Association, stated that four irrigation diversions on the West Fork Rock Creek remove much of the flow from the creek during the irrigation season (April through October) (personal communication with Jim Gruber on December 13, 2007). Mr. Gruber also stated he measures the flow in West Fork Rock Creek each week during the irrigation season and estimates the flow entering Rock Creek from West Fork Rock Creek is 2.5 to 10 cfs during the irrigation season (see January 9, 2008 letter from Jim Gruber to the Department). The 7Q10 for Rock Creek (21 cfs) plus the estimated low flow of West Fork Rock Creek (2.5

cfs) provided by Mr. Gruber will be used as the 7Q10 (23.5 cfs) in Rock Creek to calculate effluent limits in this permit.

### C. Applicable Water Quality Standards

Discharges to surface waters classified B-1 are subject to the specific water quality standards of ARM 17.30.623 (March 31, 2006), Department Circular DEQ-7 (February 2008), as well as the general provision of ARM 17.30.635 through 637. In addition to these standards, dischargers are also subject to ARM 17.30 Subchapter 5 (Mixing Zones, November 2004) and Subchapter 7 (Nondegradation of Water Quality, June 30, 2004).

ARM 17.30.635(4) requires that the design condition for disposal systems must be based on the weekly average flow of the receiving water which is expected to occur on average once in 10-years (7Q10). More restrictive requirements may be necessary due to specific mixing zone requirements.

### D. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded [ARM 17.30.502(6)]. The Department must determine the applicability of currently granted mixing zones [ARM 17.30.505(1)]. Mixing zones allowed under a permit issued prior to April 29, 1993 will remain in effect unless there is evidence that previously allowed mixing zones will impair existing or anticipated uses [ARM 17.30.505(1)(c)].

In accordance with ARM 17.30.517(1)(b), acute water quality standards for aquatic life may not be exceeded in any portion of the mixing zone unless the Department finds that allowing minimal initial dilution will not threaten or impair existing uses. The discharge must also comply with the general prohibitions of ARM 17.30.637(1) which require that state waters, including mixing zones, must be free from substances which will:

- (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
- (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
- (c) produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
- (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
- (e) create conditions which produce undesirable aquatic life.

Although certain standards may be exceeded in the mixing zone, an effluent in its mixing zone may not block passage of aquatic organisms nor may it cause acutely toxic conditions [ARM 17.30.602(16)]. No mixing zone will be granted that will impair beneficial uses [ARM 17.30.506(1)]. Acute standards may not be exceeded in any part of the mixing zone [ARM 17.30.507(1)(b)]. Aquatic life chronic, aquatic life acute and human health standards may not be exceeded outside of the mixing zone [ARM 17.30.507(1)(a)].

A standard mixing zone may be granted for facilities which discharge less than 1 million gallons per day (mgd) or when mixing is nearly instantaneous [ARM 17.30.516(d)]. Nearly instantaneous mixing is assumed if the discharge is through an effluent diffuser, when the mean daily flow exceeds the 7Q10 flow (dilution ratio <1) or the permittee demonstrates through a Department approved study plan that the discharge is nearly instantaneous. A nearly instantaneous mixing zone may not extend downstream more than two (2) river widths. Effluent discharges which do not qualify for a standard mixing zone must apply for a source specific mixing zone in accordance with ARM 17.30.518 and must conform to the requirements of 75-5-301(4), MCA which states that mixing zones must be the smallest practicable size; have minimal effects on uses; and, have definable boundaries. ARM 17.30.515(2) states that a person applying for a mixing zone must indicate the type of mixing zone and provide sufficient detail for the Department to make a determination regarding the authorization of the mixing zone under the rules of Subchapter 5.

The October 2001 SOB modified the mixing zone in Rock Creek. The modified mixing zone is based on information submitted by the applicant's engineer on September 27, 2001 and a water quality assessment performed by the Department as described in ARM 17.30.506. The water quality assessment criteria evaluated in determining the mixing zone are:

- 1) The presence of biologically important areas such as the presence of fish spawning areas or shallow water nursery areas [ARM 17.30.506(2)(a)].

Two letters from James Darling of the Montana Department of Fish, Wildlife and Parks dated February 26, 2001 and October 11, 2001 stated there are no concentrated fish spawning or rearing activities within the proposed mixing zone.

- 2) The presence of drinking water or recreational activities such as the existence of a drinking water intake or a recreational area [ARM 17.30.506(2)(b)].

Recreational activities occur on Rock Creek; however, the effluent discharged to Rock Creek will be limited to a level that ensures a nonsignificant change in water quality as defined by the criteria in ARM 16.30.715 and as described in the Red Lodge WWP renewed discharge permit.

- 3) The attraction of aquatic life to the effluent plume [ARM 17.30.506(2)(c)].

There is no temperature data that support a conclusion that fish or other aquatic life would be attracted to the effluent plume and result in adverse effects such as acute or chronic toxicity. [The average Red Lodge WWP effluent temperature is 48.7° F and the maximum temperature is 72° F. The 75<sup>th</sup> percentile temperature of Rock Creek in the summer is 49.8° F (9.9° C)(Appendix I). Therefore, it is assumed that effluent wastewater will be quickly cooled in Rock Creek and will not attract aquatic life.]

- 4) Toxicity/persistence of the substances discharged [ARM 17.30.506(2)(d)].

There is no data that support a conclusion that discharges of pollutants are at concentrations that are both toxic and persistent. The possibility is remote that any substances toxic to fish or other wildlife would pass through the treatment system and be discharged to Rock Creek because of the absence of industrial contributors to the wastewater influent. This permit will require Whole Effluent Toxicity (WET) testing limits and testing to ensure the discharge is not toxic to organisms in Rock Creek. (Also, the facility passed a WET test on June 29, 2004.)

5) Passage of aquatic organisms (including access to tributaries) [ARM 17.30.506(2)(e)].

There is no currently available data indicating that the proposed mixing zone would inhibit migration of fish or other aquatic species.

5) Cumulative effects of multiple mixing zones [ARM 17.30.506(2)(f)].

There are no other mixing zones in the area of the discharge.

6) Aquifer characteristics [ARM 17.30.506(2)(g)].

There is no indication that the movement of ground water or pollutants within the subsurface would result in adverse impacts due to a particular concentration of a parameter in the mixing zone.

7) Ground water discharge to surface water.

There are no known ground water discharges to surface water in the area of the proposed mixing zone.

8) Discharges to intermittent and ephemeral streams.

Rock Creek in the area of the proposed mixing zone is a perennial stream.

Based on ARM 17.30.516(4), a standard mixing zone must not exceed one-half times the mixing width or extend downstream more than 10 times the stream width at the 7Q10 flow, whichever is more restrictive. In the October 2001 SOB, the Department calculated one-half the stream width (1,516 feet) using the equation in ARM 17.30.516(4) and determined, based on a stream width of 30.4 feet, that the standard mixing zone of 304 feet applies to the Red Lodge WWP. The mixing zone consists of a segment of Rock Creek extending from the discharge pipe located at the Two Mile Bridge downstream a distance of approximately 304 feet. This mixing zone, designated in the previous permit, will remain in this renewed permit [ARM 17.30.505(1)(c)]. The dilution ratio is the 7Q10 (23.5 cfs) divided by the facility design flow (1.9 cfs) or 12.6.

E. Basis for WQBEL (Reasonable Potential and Calculations)

Pollutants typically present in municipal wastewater that may cause or contribute to a violation of water quality standards include conventional pollutants such as biological

material (measured by BOD<sub>5</sub>), suspended solids, oil & grease, *Escherichia coli* (*E. coli*) bacteria and pH; nonconventional pollutants such as chlorine, ammonia, nitrogen and phosphorus; and toxics such as metals and organic compounds.

Effluent limits are required for all pollutants which demonstrate a reasonable potential to exceed numeric or narrative standards. The Department uses a mass balance equation (*Equation 1*) to determine reasonable potential based on *EPA Technical Support Document for Water Quality-based Toxics Control* (TSD) (EPA/505/2-90-001). Input parameters are based on receiving water concentration; maximum projected effluent concentration, design flow of the wastewater treatment facility, and the applicable receiving water flow. The Department is proposing effluent limits for certain pollutants for which adequate data exists.

$$C_{RP} = \frac{C_E Q_E + C_S Q_S}{Q_E + Q_S} \quad (\text{Equation 1})$$

Where:

$C_{RP}$  = receiving water concentration (RWC) after mixing, mg/L  
 $C_E$  = maximum effluent concentration, mg/L  
 $C_S$  = RWC upstream of discharge, mg/L  
 $Q_S$  = applicable receiving water flow, cfs  
 $Q_E$  = facility design flow rate, cfs

#### 1. Conventional Pollutants

The facility provides a reduction in biological material and solids through secondary treatment (Section III). In addition, nondegradation load limits apply to BOD<sub>5</sub>. No additional WQBEL will be required for these parameters (BOD<sub>5</sub>, TSS and pH).

**Oil and Grease** – The previous permit included an oil and grease instantaneous maximum limit of 10 mg/L. This limit will remain in the renewal permit. Quarterly monitoring for oil and grease will be required in the renewal permit.

***Escherichia coli* (*E. coli*) Bacteria** – The previous permit included effluent limits for fecal coliform bacteria. This renewed permit identifies pathogen limits to protect public health. Montana water quality standards were revised to replace fecal coliform bacteria with *E. coli* to reflect the latest federal guidance. The applicable standards for *E. coli* bacteria are:

April 1 through October 31 of each year - the geometric mean number of *E. coli* must not exceed 126 colony forming units (cfu) per 100 milliliters (mL) and 10% of the total samples may not exceed 252 cfu per 100 mL during any 30-day period [ARM 17.30.629(2)(a)]; and

November 1 through March 31 of each year - the geometric mean number of *E. coli* must not exceed 630 cfu per 100 mL and 10% of the total samples may not exceed 1,260 cfu per 100 mL during any 30-day period [ARM 17.30.625(2)(a)(ii)].

ARM 17.30.637(1)(d) requires that state waters, including mixing zones, be free from substances which create concentrations or combinations of materials which are toxic or harmful to humans. These effluent limits apply at the end of the discharge pipe. Since the facility uses UV disinfection and the POR data show the average fecal coliform concentration in the effluent is 11 organisms per 100 mL, it is likely the facility will meet the proposed *E. coli* limits. *E. coli* limits in the renewal permit are effective immediately.

## 2. Non-conventional Pollutants

Total Residual Chlorine (TRC) - The facility utilizes UV disinfection so a TRC limit is not necessary.

Total Ammonia-N - Total Ammonia-N limits are developed based on standards that account for a combination of pH and temperature of the receiving stream, the presence or absence of salmonid species, and the presence or absence of fish in early life stages. Rock Creek is a cold water fishery with salmonids present. Appendix I summarizes the water quality parameters for total ammonia-N using the available ambient water quality data for Rock Creek. Annual and summer pH and temperature data are from a water quality study [Water Quality in Rock Creek and the West Fork Rock Creek, Red Lodge, Montana August 19, 1986, (Kerr, M. 1987)] performed on a segment of Rock Creek located south of the City of Red Lodge and approximately 10 miles upstream from the Red Lodge WWP. No winter data is available; however, if a conservative assumption is made that the ambient pH would not change in the winter and the ambient temperature of Rock Creek in the winter would be equal to or less than the summer temperature (9.9° C) of Rock Creek, the applicable chronic ammonia water quality standard in the winter would be the same as the chronic ammonia standard in the summer. Appendix II summarizes applicable ammonia water quality standards for Rock Creek.

Reasonable potential (RP) to exceed the chronic and acute water quality standards for total ammonia-N in Appendix II were assessed using *Equation 1*, where:

$$C_{RP} = \frac{C_E Q_E + C_S Q_S}{Q_E + Q_S}$$

$C_{RP}$  = receiving water concentration (RWC) after mixing, mg/L  
 $C_E$  = maximum observed effluent concentration, 11.1 mg/L  
 $C_S$  = RWC upstream of discharge, 0.01 mg/L  
 $Q_S$  = applicable receiving water flow, 23.5 cfs (100% chronic; 10% acute)  
 $Q_E$  = applicable facility design flow rate, 1.86 cfs

$$C_{RP} = \frac{(1.86 * 11.1) + (23.5 * 0.01)}{1.86 + 23.5} = 0.82 \text{ mg/L chronic; } 4.91 \text{ acute}$$

The resulting chronic and acute RP values (above), and the maximum observed effluent ammonia concentration (11.1 mg/L), are less than the chronic and acute ammonia standards in Appendix II so RP does not exist for ammonia and ammonia limits are not necessary to protect water quality in Rock Creek. Additional effluent data will be

collected this permit cycle to re-evaluate ammonia effluent limits during the next permit cycle.

Nutrients (Total Nitrogen and Total Phosphorus as P) - Rock Creek in the area of the discharge is listed as partially supporting designated uses for B-1 receiving waters on the 1996 303(d) list; nutrients have been identified as a probable source of impairment. Nutrients are not on the 2006 303(d) list so nutrient concentration effluent limits are not required to be developed (Claudia Massman August 6, 2008 memorandum).

Data are not available to perform a nonsignificance review for nutrients as required by ARM 17.30.706(2). However, the increased discharge of nutrients as a result of the increased design flow (1.2 mgd) of the Red Lodge WWP may be significant under the criteria in ARM 17.30.715(1).

The nondegradation values developed for total nitrogen and total phosphorus in the previous permit were not based on administrative rule or water quality standards. Based on the performance of the Red Lodge WWP, Appendix III uses DMR data to develop total nitrogen and total phosphorus effluent loads. Maximum daily load limits for total nitrogen and total phosphorus will be expressed as average weekly limits [ARM 17.30.1345(6)(b)]. These load limits will be included in the permit because they are based on the existing performance level of the wastewater treatment plant.

The Department has determined that a discharge in compliance with total nitrogen and total phosphorus effluent loads calculated in Appendix III will not increase the pollutant load to Rock Creek.

### 3. Toxic Pollutants

Metals and organic compounds - There are insufficient metals and organics effluent data available at this time to determine if water quality standards in Rock Creek are exceeded for these parameters. Increased monitoring requirements in this permit will collect the necessary data to evaluate these potential pollutants during the next permit cycle.

### 4. Whole Effluent Toxicity (WET)

Whole Effluent Toxicity - ARM 17.30.637(1)(d) requires that state surface waters be "free from" substances attributable to municipal, industrial or agricultural discharges that will create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life. Federal rule requires that permits include enforceable permit limits for whole effluent toxicity when the discharge causes, or has the reasonable potential to cause toxicity in the receiving water (40 CFR 122.44). The Department implements the general prohibition of 637(1)(d) with the use of whole effluent toxicity testing (40 CFR 136). Implementation guidelines and the Department's toxic control strategy for whole effluent toxics control are given in Region VIII NPDES Whole Effluent Toxics Control Program (EPA, August 1997, page 8). Limited toxicity may be authorized within a Department authorized mixing zone [see Part IV.D (Mixing Zone) of this FS for additional discussion].



In the renewal application the permittee submitted results for an acute WET test for two species from wastewater samples obtained from the facility on June 29, 2004. The wastewater sample passed the WET test.

The Department requires major facilities (greater than 1 mgd design flow) to perform WET testing. A WET limit is in the previous permit. This renewal permit includes a narrative WET limit stating “there shall be no acute toxicity in the effluent”. The permittee will be required to conduct quarterly WET testing. Two species quarterly monitoring will be required. The permittee will be required to conduct Toxicity Reduction Evaluation (TRE) / Toxicity Identification Evaluation (TIE) should persistent toxicity be identified in the effluent. Standard WET testing language will be included in the permit.

#### IV. Effluent Limits

##### A. Final Effluent Limits (Effective on the permit effective date).

<b>Table 5. Final Effluent Limitations</b>					
Parameter	Units	Effluent Limitations			
		Average Monthly Limit <sup>1</sup>	Average Weekly Limit <sup>1</sup>	Maximum Daily Limit <sup>1</sup>	Instantaneous Maximum Limit <sup>1</sup>
BOD <sub>5</sub>	mg/L	30	45	--	--
	lb/day	153	230	--	--
BOD <sub>5</sub> Removal	%	65	--	--	--
TSS	mg/L	45	65	--	--
	lb/day	450	650	--	--
TSS Removal	%	65	--	--	--
<i>E. coli</i> <sup>2,4</sup>	cfu/100 mL	126	252	--	--
<i>E. coli</i> <sup>3,4</sup>	cfu/100 mL	630	1,260	--	--
Total Nitrogen as N	lb/day	105	164	--	--
Total Phosphorus as P	lb/day	17	26	--	--
Oil and grease	mg/L	--	--	--	10
Footnotes:					
1. See definition in permit.					
2. This limit applies during the period April 1 through October 31.					
3. This limit applies during the period November 1 through March 31.					
4. Report Geometric Mean.					

pH - Effluent pH from Outfall 001 shall remain between 6.0 and 9.0 standard units (instantaneous minimum and instantaneous maximum) unless a variation is due to natural biological processes. For compliance purposes, any single analysis or measurement beyond this limitation shall be considered a violation of the conditions of this permit.

Acute Toxicity - There shall be no acute toxicity in the effluent from Outfall 001. Acute toxicity occurs when 50 percent or more mortality is observed for a test species at any

effluent concentration. Acute toxicity tests shall be conducted in accordance with the requirements in Part I. C. of the permit.

V. Monitoring Requirements

A. Influent/Effluent Monitoring

Influent samples must be obtained at the influent Parshall flume before wastewater enters the headworks system (see Figure 1).

Effluent samples must be obtained immediately after the effluent Parshall flume (see Figure 1).

**Table 6. Monitoring Requirements**

Parameter	Unit	Sample Location	Sample Frequency	Sample Type <sup>1</sup>
Flow	mgd	Influent	Continuous	<sup>4</sup>
	mgd	Effluent	Continuous	<sup>4</sup>
BOD <sub>5</sub>	mg/L	Influent	1/Week	Composite
	mg/L	Effluent	3/Week	Composite
	% Removal <sup>3</sup>	Effluent	1/Month	Calculated
	lb/day	Effluent	1/Month	Calculated
TSS	mg/L	Influent	1/Week	Composite
	mg/L	Effluent	3/Week	Composite
	% Removal <sup>3</sup>	Effluent	1/Month	Calculated
	lb/day	Effluent	1/Month	Calculated
pH	s.u.	Effluent	1/Month	Instantaneous
Temperature	°C	Effluent	1/Month	Instantaneous
<i>E. coli</i>	cfu/100 mL	Effluent	1/Week	Grab
Oil and Grease <sup>5</sup>	mg/L	Effluent	1/Quarter	Grab
Total Ammonia as N	mg/L	Effluent	1/Month	Composite
Nitrate + Nitrite as N	mg/L	Effluent	1/Month	Composite
Total Kjeldahl Nitrogen	mg/L	Effluent	1/Month	Composite
Total Nitrogen <sup>2</sup>	mg/L	Effluent	1/Week	Composite
	lb/day	Effluent	1/Week	Calculated
Total Phosphorus as P	mg/L	Effluent	1/Week	Composite
	lb/day	Effluent	1/Week	Calculated
Total Dissolved Solids (TDS)	mg/L	Effluent	1/Quarter	Grab
Dissolved Oxygen	mg/L	Effluent	1/Month	Grab
Whole Effluent Toxicity, Acute <sup>3</sup>	% Effluent	Effluent	1/Quarter	Composite

Footnotes:

1. See Definition section at end of permit for explanation of terms.
2. Calculated as the sum of Nitrate + Nitrite (as N) and Total Kjeldahl Nitrogen (as N) concentrations.
3. See narrative discussion in monitoring section of permit for additional details.
4. Requires recording device or totalizer; permittee shall report daily maximum and daily average flow on DMR.
5. Use EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM), or equivalent.

<b>Table 6. Monitoring Requirements (Continued)</b>				
Parameter	Unit	Sample Frequency <sup>7</sup>	Sample Type <sup>1</sup>	ML
Antimony, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Arsenic, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Beryllium, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Cadmium, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	0.1
Chromium, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	10
Copper, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Lead, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Mercury, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	0.1
Nickel, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	10
Selenium, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Silver, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Thallium, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	1
Zinc, Total Recoverable <sup>2</sup>	µg/L	2/year	Composite	10
Phenols, Total	µg/L	2/year	Grab	10
Hardness (as CaCO <sub>3</sub> )	mg/L	2/year	Grab	10
Volatile Organic Compounds <sup>3</sup>	µg/L	2/year <sup>5</sup>	Composite	<sup>6</sup>
Semi-Volatile, Acid Compounds <sup>4</sup>	µg/L	2/year <sup>5</sup>	Composite	<sup>6</sup>
Semi-Volatile, Base Neutral <sup>4</sup>	µg/L	2/year <sup>5</sup>	Composite	<sup>6</sup>
Footnotes: 1. See Definition section at end of permit for explanation of terms. 2. Metals shall be analyzed as total recoverable, use EPA Method (Section) 4.1.4 [EPA 600/4-79-020, March 1983] or equivalent. 3. 40 CFR 122, Appendix J, Table 2, use EPA Method 1624 Revision B, or equivalent. 4. 40 CFR 122, Appendix J, Table 2, use EPA Method 1625 Revision B, or equivalent. 5. Sampling required only in second and third calendar years after the effective date of the permit. This information will not be entered on the DMR form; a copy of the analytical laboratory report must be attached to the DMR for the applicable reporting period. 6. See approved method for minimum level (ML). 7. Samples must be collected in the first and third calendar quarters of the calendar year.				

## B. Sludge Requirements

The facility is authorized to dispose of sludge under the EPA Region VIII General Biosolids Permit authorization number MTG650022. This permit will contain standard conditions requiring authorization under the EPA General Biosolids permit for removal of biosolids from the lagoon system.

## C. Pretreatment Program

The facility is not currently operating under the EPA Pretreatment Program. The permit will include standard language restricting introducing certain pollutants to the Red Lodge WWP and requiring the facility to provide adequate notice to the Department for a new source, volume or character of industrial pollutants introduced to the system.

VI. Nonsignificance Determination

The facility must meet nondegradation limits for BOD<sub>5</sub>, TBEL limits for TSS and load limits for total nitrogen and total phosphorus based on the current performance level of the wastewater plant so the discharge from the Red Lodge WWP does not constitute a new or increased source of pollutants pursuant to ARM 17.30.702(18).

VII. Special conditions/Compliance Schedule

None

VIII. Other Information

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increases under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA, et al. (CV 97-35-M-DWM), District of Montana and Missoula Division.

The Department finds that renewal of this permit does not conflict with Judge Molloy's Order (CV 97-35-M-DVM) because it is not a new permit and the permit does not authorize an increase load or discharge of pollutants. BOD<sub>5</sub> effluent load limits can not exceed nondegradation load limits in Table 4. TBEL load limits for TSS do not exceed nondegradation load limits in Table 4. Total nitrogen and total phosphorus load limits are not increased because the load limits calculated in Appendix III and included as effluent load limits are based on the performance level of the existing wastewater treatment plant and total nitrogen and total phosphorus loads must not exceed these limits.

IX. Information Sources

40 CFR, Parts 122, 136, July 1, 2000.

ARM Title 17, Chapter 30, Subchapter 5 - Mixing Zones in Surface and Ground Water.

ARM Title 17, Chapter 30, Subchapter 6 - Surface Water Quality Standards.

ARM Title 17, Chapter 30, Subchapter 7 - Nondegradation of Water Quality.

ARM Title 17, Chapter 30, Subchapter 13 - Montana Pollutant Discharge Elimination System (MPDES) Standards.

DEQ. Circular DEQ 2, Design Standards for Wastewater Facilities. 1999.

DEQ. Circular DEQ-7, Montana Numeric Water Quality Standards. February 2008.

DEQ. Montana List of Water bodies in Need of Total Maximum Daily Load Development. 1996.

DEQ. Montana 303(d) List. A Compilation of Impaired and Threatened Water Bodies in Need of Water Quality Restoration. Part A. Water Quality Assessment Results. 2006.

DEQ. Water Pollution Control Revolving Fund Section. Facility file for Red Lodge. February 2005.

EPA. Office of Water, U.S. EPA NPDES Permit Writers' Manual, EPA-833-B-96-003. December 1996.

Kerr, M. Water Quality in Rock Creek and the West Fork Rock Creek, Red Lodge, Montana. August 19, 1986.

HKM Engineering. Operation and Maintenance Manual - Wastewater Treatment Facility, Red Lodge, Montana. Final Draft May 2003.

Montana Department of Health and Environmental Sciences. Water Quality in Rock Creek and the West Fork of Rock Creek, Red Lodge, Montana. August 19, 1986. June 1987.

Mueller Engineering, Inc. Operation and Maintenance Manual for Wastewater Stabilization Ponds, City of Red Lodge, Montana. June 1973

HKM Associates. Red Lodge Sewer Improvement Operation and Maintenance Manual. June 1985.

Prepared by: John Wadhams  
Date: October 2008

Appendix I. Water quality parameters for determination of ammonia standards for Rock Creek based on data in “Water Quality in Rock Creek and the West Fork Rock Creek, Red Lodge, Montana” (Kerr, M. 1986).

Parameter (season/unit)	Number of Samples	Average	Minimum	Maximum	75 <sup>th</sup> percentile
Temperature (°C) Annual	27	7.3	2.5	11.2	9.9
Temperature (°C) April-Oct	27	7.3	2.5	11.2	9.9
Temperature (°C) Nov-March	--	--	--	--	--
pH (s.u.) Annual	25	7.3	6.9	7.8	7.6
pH (s.u.) April-Oct	25	7.3	6.9	7.8	7.6
pH (s.u.) Nov-March	--	--	--	--	--
Ammonia (mg/L) Annual	7	0.01	0.01	0.01	0.01

<sup>1</sup> Based on 95th percentile of annual data.

## Appendix II. Applicable Ammonia Water Quality Standards for Receiving Water

Condition	Period <sup>(1)</sup>	Salmonids Present	Early Life Stages Present	Ambient Condition		Water Quality Standard <sup>(4)</sup>
				pH	Temperature °C	
Acute	Annual	Yes	NA	7.6 <sup>(2)</sup>	9.9	11.4
Chronic	Summer	Yes	Yes	7.6 <sup>(3)</sup>	9.9 <sup>(3)</sup>	3.98
Chronic	Winter <sup>(5)</sup>	Yes	Yes	7.6 <sup>(3)</sup>	≤ 9.9 <sup>(3)</sup>	3.98

Footnotes:

1. Winter period is taken to be November 1 to March 30; Summer period is taken to be April 1 to October 30.
2. Based on 95 percentile of annual data.
3. Based on 75<sup>th</sup> percentile of values in the applicable period.
4. Based on Department Circular DEQ-7 (February 2006).
5. Based on the conservative assumption that winter pH would remain the same as summer pH and winter temperature would be equal to or less than the summer temperature.

### Appendix III. Nutrient Limits

Month	Year	Flow gpm	Total Nitrogen (lb/day)	Total Phosphorus (lb/day)
April	2000	27	4.2	0.7
May	2000	325	36.7	7.1
June	2000	497	52.5	9.8
July	2000	696	67.7	14.8
August	2000	610	59.3	10.9
September	2000	678	71.6	13.5
October	2000	548	55.9	8
November	2000	467	58.3	9.2
March	2001	291	48.5	7.8
April	2001	978	200.7	28.9
June	2001	497	41.2	10.1
July	2001	696	77	11.4
August	2001	458	70.3	9.7
September	2001	509	80.6	10.5
October	2001	411	58.2	8.6
December	2001	132	3.6	0.5
January	2002	360	25.9	4.3
February	2002	200	24	3.6
March	2002	304	43.4	6.4
April	2002	328	43.7	7.5
May	2002	456	46.5	9.1
June	2002	660	65.7	11.5
July	2002	656	54.3	12.1
August	2002	573	58.5	11.8
September	2002	500	58.2	11.9
October	2002	578	92.9	14
November	2002	475	74.7	11.5
December	2002	387	56.2	7.8
January	2003	357	51.9	7.7
February	2003	378	59	8.8
March	2003	598	98.3	15
April	2003	444	53.3	7.6
May	2003	644	71.1	9.9
June	2003	749	73.7	11.8
July	2003	662	111.2	14.9
August	2003	561	84.2	12.8



September	2003	493	79.9	12.5
October	2003	438	52.6	7.3
November	2003	423	49.2	6.4
December	2003	339	43.5	5.6
January	2004	351	57.3	7.5
February	2004	308	59.1	8.2
Average			61.30	9.74
Standard Deviation			30.704	4.546
Coefficient Variation (CV)			0.5	0.5
Maximum – LTA Multiplier			2.68	2.68
Average – LTA Multiplier			1.72	1.72
Maximum Daily Limit (MDL)			164.3	26.1
Monthly Average Limit (AML)			105.4	16.7

Source: EPA, 1994, TSD, Table 5.2, MDL 99th Percentile Source: EPA, 1994, TSD, Table 5.2, AML 99th Percentile, n=4
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Figure 1 – Sample Locations

